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(54) Title: PROCESSING AQUEOUS TITANIUM CHLORIDE SOLUTIONS TO ULTRAFINE TITANIUM DIOXIDE

(57) Abstract: A hydrometallurgical process is provided for producing ultrafine or nano-sized titanium dioxide containing solutions, particularly titanium chloride solutions. The process is conducted by total evaporation of the solution, above the boiling point of the solution and below the temperature where there is significant crystal growth. Chemical control additives may be added to control particle size. Nano-sized elemental particles are formed after calcination. The titanium dioxide can be either anatase or rutile. Following calcination, the titanium dioxide is milled to liberate the elemental particles and provide a high quality nano-sized TiO₂ with a narrow particle size distribution.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C01G C01B C09C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 166 126 A (MITSUBISHI MINING & CEMENT CO) 30 April 1986 (1986-04-30) the whole document	1-3, 5-11, 15-19, 21-27, 31,32
Y	GB 481 892 A (TITAN COMPANY INC.) 18 March 1938 (1938-03-18) page 2, line 47 - line 90 -/--	1-3, 5-11, 15-19, 21-27, 31,32

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 197 25 616 C (MAX PLANCK GESELLSCHAFT) 19 November 1998 (1998-11-19) the whole document	1-3, 6-8, 14-19, 22-24, 30-33
A	WO 97 10185 A (CHARTIER PASCAL ;CHOPIN THIERRY (FR); LEHAUT CORINNE (FR); TALPAER) 20 March 1997 (1997-03-20) page 15, line 32 -page 17, line 30 page 21, line 1 -page 23, line 17; figure 4	1-33
A	GB 497 694 A (TITAN COMPANY INC.) 23 December 1938 (1938-12-23) the whole document	1-3, 8-11, 15-19, 24-27, 31, 32

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2166126 A	30-04-1986	NONE	
GB 481892 A		NONE	
DE 19725616 C	19-11-1998	NONE	
WO 9710185 A	20-03-1997	FR 2738836 A FR 2738812 A AT 198733 T AU 6992796 A BR 9610289 A CZ 9800756 A DE 69611618 D EP 0850203 A JP 11512336 T PL 325526 A TR 9800474 T US 6037289 A	21-03-1997 21-03-1997 15-02-2001 01-04-1997 21-12-1999 12-08-1998 22-02-2001 01-07-1998 26-10-1999 03-08-1998 21-05-1998 14-03-2000
GB 497694 A		NONE	